

greenhouse GROWER

"Some plants are sensitive to certain pathogens more than others. Using a professional lab for disease diagnostic and building up

"To understand how to grow a quality plug, you must first define what a quality plug is. Some will argue that a quality plug is simply one that is able to be

"After all, how many times can someone harvest basil leaves off of one basil plant in a combination pot? Large twelve-inch bowls of basil can be cheap to grow and are a much more

"Once you are able to ide

THE "Talking Shop" ISSUE



What You Can Learn From The Best In The Business

Top Production Insight From:

Lucas Greenhouses' **George Lucas**

Costa Farms' **Andrew Britten**

Stacy's Greenhouses' **Regina Coronado**

Terra Nova's **Dan Heims**

Rocket Farms' **Marc Clark**

Kube Pak's **Hank Bukowski**

Nortex Wholesale's **Aaron Pinkus**

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December 2010 | Volume 28, No. 14

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Cover illustration by Brad Kahl



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Organization Profile

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Dig In To The Talking Shop

JUST about every issue of Greenhouse Grower over the last 27 years has offered at least a story or two with production advice to make your job easier. Whether you're pressed to control a particular crop's height, fine-tune a substrate's pH or adjust the amount of light your annuals are taking, Greenhouse Grower has been your go-to source for production advice for more than a quarter century.

But for the first time in Greenhouse Grower's history, we're devoting an entire issue to production. This inaugural Talking Shop Issue has an added twist, too, in that past Grower of the Year winners and finalists are doing a bunch of the "talking."

Want to perfect your plug production? Get insights on producing quality plugs from Andrew Britten (page 8), the director of propagation and technical services at Costa Farms and Total Growth Solutions. Considering venturing into the world of tissue culture at your greenhouse operation? Terra Nova's Dan Heims has you covered with the guidelines to get you started (page 12). How about a sneak peek inside the perennial playbook of Regina Coronado, our 2010 Head Grower of the Year? Coronado, who's the head grower at Stacy's Greenhouses, shares her keys to production, too (page 22).

One great characteristic of the greenhouse floriculture industry is that growers are more than willing to share information with each other. Sure, all growers keep a few "secrets" stashed away in their mental safes – you know, the secrets that separate the perfect crops from the pretty darn good ones – but even the best growers are willing to lend a hand to answer production questions, further another's and, ultimately, enhance the industry as a whole.

About Talking Shop

Still, there are enough production "secrets" in the Talking Shop Issue for every reader to glean at least one tip. There are also good production reminders on the pages that follow – particularly one Kube Pak's Hank Bukowski offers in his page 18 essay, "Remember The Basics."

Whether you're a current horticulture student or a 50-year veteran grower, diagnosing production issues usually comes down to simple inputs like soil, water, fertilizer and temperature. So the next time a crop fails and you can't figure out what went wrong, think back on the early years of your career and greenhouse growing at its simplest. The answer may a Greenhouse 101 lesson away.

If the answers aren't in your memory bank of college courses, though, the next best place to find them is online at FreshAirForum.com – our online "Talking Shop." Many of you already are Fresh Air Forum members and active in discussions, posing broad questions like which pots you prefer – plastic or other materials – and specific ones like which pumps do you recommend for pond irrigation.

Perhaps the number one benefit of using Fresh Air Forum is the speed at which growers get their answers. If you stumble onto a production issue in the morning and post your question shortly thereafter, another grower is likely to offer a solution by the afternoon. The forum truly is a "Talking Shop" with the best of them. **GG**

"Finding local suppliers or taking cuttings from your own healthy stock plants help maximize propagation success as you

"The underlying goal is to grow a quality plug, which must first develop in a sterile environment and will then grow into a quality finished plant. The quality plug is the

"The underlying goal is to grow a quality plug, which must first develop in a sterile environment and will then grow into a quality finished plant. The quality plug is the

"Talking Shop" THE ISSUE

maximize the consumer's chances of success?"

Tissue Culture Tips

Curious how plants from tissue culture move from the lab to the real world? Take a step inside Terra Nova Nurseries to find out.

by DAN HEIMS and TIM SANDER

OUR world has changed thanks to tissue culture. From exotic orchids at Trader Joe's to the Autumn Glory maples along our city streets, consumers and landscapers have both found the superior quality, health and vigor of these plants to be amazing.

Even before a plant enters the lab, it undergoes rigid viral testing by companies like Agdia, which runs as many as 21 different tests to make sure plants are as virus free as possible. These plants are called elite stock.

Under the sterile conditions of the lab, numbers of plants begin to increase after being placed into an agar gel with necessary hormones, sugars and salts. Multiplying these plants in geometrically increasing numbers, at specific intervals, can quickly bring a starter culture of a few plants to a hundred thousand in a year's time. At some point, when the target goal has been reached, roots are needed. Plants are then transferred to a different medium that contains root hormone in the agar. Tissue culture plants are



incredibly vigorous, but the agar-grown roots are extremely tender and must be replaced by stronger roots after being placed in the soil media.

With increasing shipping costs of full-sized plugs being a deterrent factor, more labs are sending huge numbers of plants out in Stage 3. These are rooted plantlets that come in agar or are placed on paper towels and gently rolled. Thousands of plants can then be sent in a standard cardboard shipping case. Temperature extremes must be avoided at this tender stage. Some of the world's more primitive tissue culture-weaning facilities are in South Africa. Some of the world's best are in Gensingen, Germany. All facilities produce plants, but losses can be high unless clean work and growing areas can be provided.

Environmental Factors In Weaning

Know that plants have been in a very stable growing environment under very

high humidity (in the growing vessels). Terra Nova uses Delta T bench heat tubes under a steel bench mesh with a capillary mat and a woven poly top. The bottom heat is maintained at an even 72°F. The mesh prevents cold spots that can cause uneven results in rooting. Humidity needs to be monitored by a humidistat to maintain a relative humidity (RH) of 65 to 80 percent.

Some crops do require 80 to 90 percent RH and a responsible lab will help you with this information. Tents or tunnels on the benches covered with white poly can provide this high level of humidity. The sides of these tents are slowly raised over time as the plants are acclimated.

Additionally, Terra Nova uses 400-watt HPS lights for day length extension and night interruption. Lights are activated by a sensor that turns the light fixtures on if enough light is not received during the day. Cooler night temperatures of around 66°F are maintained. A night-time heat retention blanket saves energy losses and a shade cloth is pulled over to shade the crops at a sensor-driven light point. High air-flow fans (HAF) keep a

Terra Nova Nurseries



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Operation of the Year
Finalist, 2010

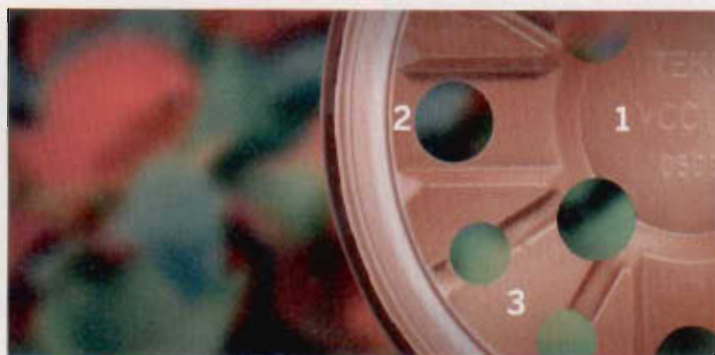
healthy flow of circulation around the plants and are not turned off.

Media & Planting

A sterile mix of 80 percent peat to 20 percent perlite is used in the plug trays. The soil is lime adjusted, taking into account the water pH (adjusted to 5.8 to 6.3). The soil is also given a weak starter



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


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charge of fertilizer. The trays are prefilled and watered via a water tunnel before planting. Plantlets are carefully pulled from the agar by crews working on stationary tables. Planters will pre-dibble holes with their forceps before placing the plantlet in the hole. All agar must be removed from the plants as it can be a hotbed for Botrytis.

The planting crew is responsible for grading the tissue culture plantlets by root size, crown and top growth. Burying a plant too deep will kill it by drowning. Planting it too high will kill it, too, as it would then desiccate the plant. Knowing which planters have low success rates can flash a red light for retraining on technique. Again, a responsible lab would show a customer the proper depth and planting technique. The trays are labeled and lot numbers are assigned. After planting, the flats are run through the water tunnel to be settled in.



More Online

Visit Terra Nova Nurseries and its tissue culture lab via video and slideshow at GreenhouseGrower.com.

Settling In

Every greenhouse has its own microclimates, and you will find certain crops like ferns prefer cooler spots while others prefer hot spots. Flats are placed on benches by variety and preferences.

For the first five days, misting by hand is the best procedure. A gentle, 50 ppm calcium-based fertilizer (CLF) is applied

five to seven days after planting when regular watering can start. As small as the plantlets are, they have great vigor, almost seedling-like, and roots can be to the side of the cell in seven to 10 days. Terra Nova uses both biological and chemical control for shore flies or fungus gnats, which can be monitored by yellow cards. These pests can be devastating to a crop, so it's impor-

tant to start immediately with control.

Again, the more clean and sterile the growing areas are, the fewer problems you'll have. It's also important to sterilize benches between crops and watch for algae, a fungus gnat *Motet 6*, *Botrytis* and root diseases and molds like *Thalaviopsis*, *Phytophthora* and *Rhizoctonia* can be kept in check by fungicidal measures.



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Those on a more organic scheme can use nematodes for gnat control, and Mycorrhizal fungi inoculants and BT products like Serenade for fungal control.

Plants will be in the weaning process for four to 12 weeks depending on the variety. Once out, it can go into less humid greenhouses or shade houses. Always keep your eyes open for signs of desiccation. After four to six weeks of outside weaning, plants can be shipped or potted up into larger containers. Always remember to not bury plugs too deep – it's the number one killer of tissue cultured material.

Takeaways

With the benefits of superior plant material and much-reduced shipping, it makes sense to bring in plants in Stage 3. As with all other crops, there is a formula – perhaps you could call it a recipe for success. Don't underestimate the need for the proper soil medium, planting depth, high humidity – even light and temperatures and keeping it clean. **GG**

About the authors: Dan Heims is president and Tim Sander is nursery manager at Terra Nova Nurseries in Canby, Ore. Learn more about Terra Nova at TerraNovaNurseries.com. You can reach Heims at dan@terravanurseries.com. Sander can be reached at tim@terravanurseries.com.